

## **Mode-Locked Fiber Laser Using Charcoal and Graphene Saturable Absorbers to Generate 20-GHz and 50-GHz Pulse Trains, Respectively**

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**Abstract :** A 20-GHz and a 50-GHz pulse train are generated using a fiber ring laser setup that incorporates Rational Harmonic Mode Locking. Two separate experiments were carried out using charcoal nanoparticles and graphene nanoparticles acting as saturable absorbers to reduce the pulse width generated from rational harmonic mode-locking (RHML). Autocorrelator trace shows that the pulse width is reduced from 5.6-ps to 3.2-ps using charcoal at 20-GHz, and to 2.7-ps using graphene at 50-GHz repetition rates, which agrees with the simulation findings. Numerical simulations have been carried out to study the effect of varying the linear and nonlinear absorbance parameters of both absorbers on output pulse widths. Experiments closely agree with the simulations.

**Keywords :** fiber optics, fiber lasers, mode locking, saturable absorbers

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